

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 22 MAR 2005

WIPO

PCT

| | | | | |
|--|--|---|--|--|
| Applicant's or agent's file reference P200201998 | | FOR FURTHER ACTION | | See Form PCT/IPEA/416 |
| International application No. PCT/EP 03/14530 | | International filing date (day/month/year) 18.12.2003 | | Priority date (day/month/year) 30.01.2003 |
| International Patent Classification (IPC) or national classification and IPC H04B1/707 | | | | |
| Applicant TELEFONAKTIEBOLAGET L M ERICSSON (PUBL) et al. | | | | |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 5 sheets, as follows:</p> <p style="margin-left: 40px;"><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p style="margin-left: 40px;"><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> | | | | |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p> | | | | |
| Date of submission of the demand 23.08.2004 | | Date of completion of this report 23.03.2005 | | |
| Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016 | | Authorized Officer Nilsson, M Telephone No. +31 70 340-3928 | | |



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP 03/14530

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-17 as originally filed

Claims, Numbers

1-21 filed with telefax on 02.03.2005

Drawings, Sheets

1/9-9/9 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
 - ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/EP 03/14530

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|------|
| Novelty (N) | Yes: Claims | 1-21 |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | 1-21 |
| | No: Claims | |
| Industrial applicability (IA) | Yes: Claims | 1-21 |
| | No: Claims | |

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

Reference is made to the following document:

D1: WO 00/69086 A (BORGHS ERIC ;VANHOOF JAN (BE); LUGIL NICO (BE);
MERTENS CARL (BE);) 16 November 2000 (2000-11-16)

1. INDEPENDENT CLAIM 1

- 1.1 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and shows (the references in parentheses applying to this document):
A method of receiving radio signals in a receiver for a digital wireless communications system (*Abstract*), the method comprising the steps of:
- level adjusting a received radio signal by an automatic gain control (*paragraphs 108-109; Figure 8*); and
 - despreading the level adjusted signal in a RAKE unit having a number of fingers, thus providing a number of despread data symbols, each despread data symbol being represented by a first number of bits (*paragraphs 113-115; Figure 11*).

The subject-matter of claim 1 differs from this known method in that it further comprises the steps of

- truncating the despread data symbols provided from the RAKE unit to obtain truncated data symbols represented by a second number of bits, said second number being smaller than said first number, wherein the second number of bits are selected as the least significant bits of the first number of bits representing a despread data symbol;
- saturating the truncated data symbols to obtain saturated data symbols by replacing a truncated data symbol with the highest value that can be represented by the second number of bits, if the value of the despread data symbol from which that truncated data symbol was obtained is larger than said highest value, and replacing a truncated data symbol with the lowest value that can be represented by the second number of bits, if the value of the despread

- data symbol from which that truncated data symbol was obtained is less than said lowest value; and
- level adjusting the despread data symbols provided from the RAKE unit (14) in dependence of said despread data symbols, so that overflow for the truncated data symbols is prevented.

The subject-matter of claim 1 is therefore new (Article 33(2) PCT).

- 1.2 The problem to be solved by the present invention may be regarded as how to obtain a correct symbol combination in a RAKE receiver when the signal saturates the resolution of the bits available for the finger demodulation and avoid losing valuable phase information.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) since it is neither disclosed nor rendered obvious by any available prior art.

2. **INDEPENDENT CLAIM 10**

Independent claim 10 essentially defines the features of independent claim 1, with minor modifications. Hence a similar assessment as in paragraphs 1.1 and 1.2 can be carried out and therefore claim 10 also meet the requirements of the PCT with respect to novelty and inventive step as required by Articles 33(2) and 33(3) PCT.

3. **DEPENDENT CLAIMS 2-9 AND 11-21**

Claims 2-9 and 11-21 are dependent on claims 1 and 10 and as such also meets the requirements of the PCT with respect to novelty and inventive step.

4. **REMARKS**

Claims 6-9 and 15-21 has been drafted as multiple dependent claims referring back to other multiple dependent claims contrary to Rule 6.4(a) PCT.

EPO - DG 1

18

07 03. 2005

P a t e n t c l a i m s :

(68)

5 1. A method of receiving radio signals in a receiver (2) for a digital wireless communications system, the method comprising the steps of:

- level adjusting a received radio signal by an automatic gain control (12); and
- despreading the level adjusted signal in a RAKE unit (14) having a number of fingers, thus providing a number of despread data symbols, each despread data symbol being represented by a first number of bits,

10 c h a r a c t e r i z e d in that the method further comprises the step of

- truncating the despread data symbols provided from the RAKE unit (14) to obtain truncated data symbols represented by a second number of bits, said second number being smaller than said first number, wherein the second number of bits are selected as the least significant bits of the first number of bits representing a despread data symbol;
- saturating the truncated data symbols to obtain saturated data symbols by replacing a truncated data symbol with the highest value that can be represented by the second number of bits, if the value of the despread data symbol from which that truncated data symbol was obtained is larger than said highest value, and replacing a truncated data symbol with the lowest value that can be represented by the second number of bits, if the value of the despread data symbol from which that truncated data symbol was obtained is less than said lowest value; and
- level adjusting the despread data symbols provided from the RAKE unit (14) in dependence of said despread data symbols, so that overflow for the truncated data symbols is prevented.

25 2. A method according to claim 1, c h a r a c t e r i z e d in that said step of level adjusting the despread data symbols provided from the

RAKE unit (14) comprises the step of measuring the level of the despread data symbols.

5 3. A method according to claim 1, c h a r a c t e r i z e d in that said step of level adjusting the despread data symbols provided from the RAKE unit (14) comprises the step of measuring the level of the saturated data symbols.

10 4. A method according to any one of claims 1 to 3, c h a r a c t e r - i z e d in that said level adjusting of the despread data symbols is performed by adjusting a reference value of said automatic gain control (12).

15 5. A method according to any one of claims 1 to 3, c h a r a c t e r - i z e d in that said level adjusting of the despread data symbols is performed by adjusting the level of each despread data symbol individually in dependence of that despread data symbol.

20 6. A method according to any one of claims 1 to 5, c h a r a c t e r - i z e d in that said level adjusting is based on the largest of an inphase component and a quadrature component of said despread data symbols.

25 7. A method according to any one of claims 1 to 6, c h a r a c t e r - i z e d in that said level adjusting is based on data symbols averaged over time.

8. A method according to any one of claims 1 to 7, c h a r a c t e r - i z e d in that said level adjusting is performed by using a Proportional-Integral control algorithm.

30 9. A method according to any one of claims 1 to 8, c h a r a c t e r - i z e d in that said level adjusting is performed by selecting one of two different adjustment levels.

10. A receiver (2) for receiving radio signals in a digital wireless communications system, the receiver having means for:

- level adjusting a received radio signal by an automatic gain control (12); and
- 5 • despreading the level adjusted signal in a RAKE unit (14) having a number of fingers, thus providing a number of despread data symbols, each despread data symbol being represented by a first number of bits,

10 c h a r a c t e r i z e d in that the receiver further comprises means for

- truncating the despread data symbols provided from the RAKE unit (14) to obtain truncated data symbols represented by a second number of bits, said second number being smaller than said first number, wherein the second number of bits are selected as the least significant bits of the first number of bits representing a despread data symbol;
- 15 • saturating the truncated data symbols to obtain saturated data symbols by replacing a truncated data symbol with the highest value that can be represented by the second number of bits, if the value of the despread data symbol from which that truncated data symbol was obtained is larger than said highest value, and replacing a truncated data symbol with the lowest value that can be represented by the second number of bits, if the value of the despread data symbol from which that truncated data symbol was obtained is less than said lowest value; and
- 20 • level adjusting the despread data symbols provided from the RAKE unit (14) in dependence of said despread data symbols, so that overflow for the truncated data symbols is prevented.
- 25

30 11. A receiver according to claim 10, c h a r a c t e r i z e d in that it is adapted to adjust the level of the despread data symbols provided from the RAKE unit (14) by means of measuring the level of the despread data symbols.

12. A receiver according to claim 10, c h a r a c t e r i z e d in that it is adapted to adjust the level of the despread data symbols provided from the RAKE unit (14) by means of measuring the level of the saturated data symbols.

5

13. A receiver according to any one of claims 10 to 12, c h a r a c - t e r i z e d in that it is adapted to adjust the level of the despread data symbols by adjusting a reference value of said automatic gain control (12).

10

14. A receiver according to any one of claims 10 to 12, c h a r a c - t e r i z e d in that it is adapted to adjust the level of the despread data symbols by adjusting the level of each despread data symbol individually in dependence of that despread data symbol.

15

15. A receiver according to any one of claims 10 to 14, c h a r a c - t e r i z e d in that it is adapted to base said level adjusting on the largest of an inphase component and a quadrature component of said despread data symbols.

20

16. A receiver according to any one of claims 10 to 15, c h a r a c - t e r i z e d in that it is adapted to base said level adjusting on data symbols averaged over time.

~~10-16~~

25

17. A receiver according to any one of claims ~~10 to 16~~, c h a r a c - t e r i z e d in that it is adapted to perform said level adjusting by using a Proportional-Integral control algorithm.

30

18. A receiver according to any one of claims 10 to 17, c h a r a c - t e r i z e d in that it is adapted to perform said level adjusting by selecting one of two different adjustment levels.

19. A receiver according to any one of claims 10 to 18, c h a r a c - t e r i z e d in that the receiver is a WCDMA receiver.

20. A computer program comprising program code means for performing the steps of any one of the claims 1 to 9 when said computer program is run on a computer.

5

21. A computer readable medium having stored thereon program code means for performing the method of any one of the claims 1 to 9 when said program code means is run on a computer.

10